

**Claims**

1. An optical transmission cable interconnect for insertion in an undersea optical transmission cable, said interconnect comprising:
  - a plurality of modules, each of said modules including:
    - an internal housing having an outer dimension substantially equal to an outer dimension of an internal fiber splice housing of an undersea optical fiber cable joint, said internal housing including:
      - a pair of opposing end faces each having a retaining element for retaining the internal housing within an outer housing of said undersea optical fiber cable joint, said retaining element including an aperture through which at least one optical fiber extending from an end portion of the optical transmission cable extends into the internal housing;
      - a sidewall interconnecting said opposing end faces and extending between said opposing end faces in a longitudinal direction, said sidewall including a receptacle portion having a plurality of thru-holes each being sized to receive a passive optical component employed in an optical amplifier; and
      - a first segment of undersea optical transmission cable operationally coupling a first end face of a first of the modules to a second end face of a second of the modules.
2. The interconnect of claim 1 further comprising a plurality of undersea optical transmission cable pigtails operationally coupled to a second end face of the first module and a first end face of the second module, respectively.
3. The interconnect of claim 1 wherein at least one of said modules contains at least one optical amplifier.
4. The interconnect of claim 1 wherein each of said modules contains at least one optical amplifier.

5. The interconnect of claim 1 wherein the first of the modules contains optical components of at least one optical amplifier and a second of the modules contains electronic components of the at least one optical amplifier.
6. The interconnect of claim 1 wherein the first of the modules contains a subset of components required of at least one optical amplifier and a second of the modules contains remaining components of the at least one optical amplifier.
7. The interconnect of claim 1 further comprising:  
a plurality of undersea optical fiber cable joints;  
a plurality of undersea optical transmission cable pigtails  
operationally coupling a first of the cable joints to a second end face of the first module and a second of the cable joints to a first end face of the second module, respectively.
8. The interconnect of claim 1 wherein said plurality of thru-holes laterally extend through said receptacle portion of the sidewall in the longitudinal direction.
9. The interconnect of claim 1 wherein said internal housing has a generally cylindrical shape, said receptacle portion of the sidewall having a curvature that defines a diameter of the cylindrical shape.
10. The interconnect of claim 1 wherein the undersea optical fiber cable joint is a universal joint for jointing optical cables having different configurations.
11. The interconnect of claim 1 wherein said universal joint includes a pair of cable termination units in which end portion of the optical cables to be

jointed are respectively retained, said retaining elements each being connectable to one of the cable termination units.

12. The interconnect of claim 1 further comprising an optical fiber storage area located within said internal housing.

13. The interconnect of claim 1 further comprising a support member for supporting at least one circuit board on which reside electronics associated with the optical amplifier.

14. The interconnect of claim 1 wherein said optical fiber storage area includes at least one optical fiber spool around which optical fiber can be wound.

15. The interconnect of claim 1 wherein said internal housing is formed from a pair of half units each having a mating surface extending in a longitudinal plane that includes the longitudinal direction, said half units being interconnected to one another along said mating surfaces.

16. The interconnect of claim 13 wherein said support member supporting the circuit board is arranged so that the circuit board and the mating surface form a substantially continuous plane.

17. The interconnect of claim 13 wherein said support member is defined by a lip extending inwardly from, and recessed below, said mating surface.

18. The interconnect of claim 1 wherein said sidewall includes a pair of ribbed members extending longitudinally from the receptacle portion of the sidewall, said ribbed members each having a tension rod thru-hole extending laterally therethrough in the longitudinal direction for supporting a tension rod employed by the undersea optical fiber cable joint.

19. The interconnect of claim 1 wherein the outer dimension of the internal housing is less than about 15 cm x 50 cm.

20. The interconnect of claim 1 wherein the outer dimension of the internal housing is about 7.5 cm x 15 cm.

21. An optical transmission cable interconnect for insertion in an undersea optical transmission cable, said interconnect comprising:

a plurality of undersea optical fiber cable joints;

an optical amplifier module that includes:

an internal housing having an outer dimension substantially equal to an outer dimension of an internal fiber splice housing of an undersea optical fiber cable joint, said internal housing including:

a pair of opposing end faces each having a retaining element for retaining the internal housing within an outer housing of said undersea optical fiber cable joint, said retaining element including an aperture through which at least one optical fiber extending from the end portion of one of the optical cables extends into the internal housing;

a sidewall interconnecting said opposing end faces and extending between said opposing end faces in a longitudinal direction, said sidewall including a receptacle portion having a plurality of thru-holes each being sized to receive a passive optical component employed in an optical amplifier; and

a plurality of segments of undersea optical transmission cable, a first of said segments operationally coupling a first end face of a first of the cable joints to a first end face of the optical amplifier module and a second of said segments operationally coupling a first end face of a second of the cable joints to a second end face of the optical amplifier module.

22. The interconnect of claim 21 further comprising a plurality of undersea optical transmission cable pigtails operationally coupled to a second end face of the first cable joint and a second end face of the second cable joint, respectively.

23. The interconnect of claim 21 wherein said plurality of thru-holes laterally extend through said receptacle portion of the sidewall in the longitudinal direction.

24. The interconnect of claim 21 wherein said internal housing has a generally cylindrical shape, said receptacle portion of the sidewall having a curvature that defines a diameter of the cylindrical shape.

25. The interconnect of claim 21 wherein the undersea optical fiber cable joint is a universal joint for jointing optical cables having different configurations.

26. The interconnect of claim 21 wherein said universal joint includes a pair of cable termination units in which end portion of the optical cables to be jointed are respectively retained, said retaining elements each being connectable to one of the cable termination units.

27. The interconnect of claim 21 further comprising an optical fiber storage area located within said internal housing.

28. The interconnect of claim 21 further comprising a support member for supporting at least one circuit board on which reside electronics associated with the optical amplifier.

29. The interconnect of claim 21 wherein said optical fiber storage area includes at least one optical fiber spool around which optical fiber can be wound.

30. The interconnect of claim 21 wherein said internal housing is formed from a pair of half units each having a mating surface extending in a longitudinal plane that includes the longitudinal direction, said half units being interconnected to one another along said mating surfaces.

31. The interconnect of claim 28 wherein said support member supporting the circuit board is arranged so that the circuit board and the mating surface form a substantially continuous plane.

32. The interconnect of claim 28 wherein said support member is defined by a lip extending inwardly from, and recessed below, said mating surface.

33. The interconnect of claim 21 wherein said sidewall includes a pair of ribbed members extending longitudinally from the receptacle portion of the sidewall, said ribbed members each having a tension rod thru-hole extending laterally therethrough in the longitudinal direction for supporting a tension rod employed by the undersea optical fiber cable joint.

34. The interconnect of claim 21 wherein the outer dimension of the internal housing is less than about 15 cm x 50 cm.

35. The interconnect of claim 21 wherein the outer dimension of the internal housing is about 7.5 cm x 15 cm.